Ownership matrix

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1.0 PURPOSE AND SCOPE

(5.1.1, 5.1.2, 5.1.3)

This standard provides guidance to the Tank Operations Contractor (TOC) and subcontract engineers on ventilation system design, installation, and material requirements. The scope of this standard includes design of new ventilation systems or significant modification of existing ventilation systems.

The technical basis for the requirements in this standard, and approved deviations, can be found in RPP-RPT-28583.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

NOTE: Deviations to any requirements of this standard shall be requested from the standard document owner. Approved deviations shall be documented in the accompanying Standard Basis Document RPP-RPT-28583.

3.0 STANDARD

3.1 Design Requirements

3.1.1 General

The DOE Nuclear Air Cleaning Handbook (DOE-HDBK-1169-2003), ASHRAE Handbooks, and the Industrial Ventilation Handbook, published by the American Conference of Governmental Industrial Hygienists (ACGIH), shall be used for guidance when designing new ventilation systems or modifications to existing ventilation systems. Additional guidance can be found in RPP-RPT-28583.

3.1.2 Codes and Standards

The codes and standards identified in Table 1 shall be used for ventilation system design and procurement. All system design and equipment selection shall be supported by calculations prepared in accordance with TFC-ENG-DESIGN-C-10, and incorporated and referenced in the System Design Description, as applicable.

3.1.3 Operating Specifications

The criteria identified in the applicable Operating Specification Document (OSD) shall be used for all tank farm ventilation system design modifications. Ventilation system modifications shall be designed to ensure tank internal pressure is maintained in accordance with OSD-T-151-00013 and OSD-T-151-00007. Modifications to the 241-AZ-702 Vessel Ventilation system shall be designed to ensure the requirements of OSD-T-151-00019 are met.

3.1.4 Environmental/Seasonal Design Conditions

Use TFC-ENG-STD-02 for environmental/seasonal design conditions.

3.1.5 Tank Headspace Air Design Conditions

The tank headspace temperature design condition ranges between 40°F to 150°F, up to 100% relative humidity and may contain varying amounts of hydrogen, nitrous oxides, methane, and ammonia vapors. The storage tanks contain high pH (10-14 nominal) waste.

3.1.6 Fire Protection

A fire hazard and fire safety analysis shall be performed on all new systems in accordance with the requirements of TFC-ESHQ-FP-STD-06 to ensure that the fire protection requirements of exhaust plenum filter installations are evaluated as required by ORP M 420.1-1, Section 6.4.b, and DOE-STD-1066-99, Section 14.

3.1.7 Materials

Metallic parts shall be of corrosion-resistant metal, or suitably finished to resist corrosion, except temporary connection material (e.g., connecting ductwork and condensate piping that can be easily replaced).

Dissimilar metals, such as those defined by MIL-STD-889, that have active electrolytic corrosion properties shall not be used in direct contact, except temporary connection material (e.g., connecting ductwork and condensate drain).

Material subject to deterioration when exposed to climatic and other environmental conditions specified herein shall be protected against such deterioration.

Materials shall be free from defects or imperfections that may affect performance. The use of rebuilt or refurbished components is prohibited for initial construction.

3.2 Performance Characteristics

3.2.1 Design Flow Rate

The design flow rate shall be determined based on the loads expected to achieve design conditions. Active ventilation ductwork systems shall be designed by the constant velocity method and pre-balanced through duct sizing.

3.2.2 Tank Vacuum Pressure

The maximum vacuum allowable on the tanks is established to prevent side wall buckling or bottom lifting of the tank as described in the OSD's. The criteria identified in the applicable operating specification documents shall be used for all tank farm ventilation system designs.

3.2.3 Emissions

The system shall be designed to monitor or extract, collect, and measure radioactive emissions in accordance with environmental regulations and the applicable air permit.

3.2.4 Noise Levels

The stack and mechanical equipment noise emissions at the maximum flow rate condition shall be less than 85 dBA, 8-hour time weighted average, or equivalent noise dose when measured by a calibrated noise meter at 1 meter from the source.

3.2.5 Reliability

The design life shall be documented in the WRPS performance specification for all new systems. Permanently installed ventilation systems shall typically be designed for a useful life of 40 years; however, a graded approach shall be used when specifying equipment useful life.

3.2.6 Maintainability

Equipment, instrumentation, and items requiring maintenance shall be accessible for ease of inspection and removal/replacement. The ventilation system shall be constructed to facilitate maintenance with commercially available tools wherever possible.

Consideration must be given to ensure components can be decontaminated and ultimately decommissioned, dismantled, and disposed of as radioactive and/or hazardous waste.

3.3 Duct Work

Ducts (pipe) shall be sized to ensure design flow rates can be achieved using the constant velocity method. The recommended velocity of air within the duct is 2,000 fpm to remove light dusts and particulate; however, this may be modified for the removal of particular vapors and gases. The system shall be designed to maintain a minimum capture velocity of 1,000 fpm. Materials shall be compatible with the exhaust stream constituents.

Duct work shall be sloped a minimum of 1/8-inch per foot to allow for adequate slope to drain internal condensate back to a tank, a seal pot, to the exhaust system condensate collection system, or to a sound tank.

Structural analysis considering dead weight loads, differential temperature and pressure loads, wind, and seismic loads shall be required on all safety-related systems, systems that carry hazardous materials, or that must remain operational during and after an earthquake.

3.4 Isolation Valves

Isolation valves shall be constructed of materials that are compatible with their connecting fittings and suitable for their fluid service. Butterfly valves and ball valves that meet the requirements of ASME B31.1 and ASME B16.34 are commonly used. Additional detailed requirements on existing ventilation systems are provided as notes on drawing H-2-90718, sheet 10.

3.5 Conditioning Equipment

Active ventilation systems shall be designed to control air conditions such that air entering any HEPA filter assembly does not exceed 70% relative humidity (RH).

A documented calculation shall be performed for all ventilation systems to determine the temperature differentials required across conditioning equipment components.

3.6 Prefilter

A prefilter is recommended to be installed upstream of HEPA filters to remove large particles. The prefilter efficiency rating shall be 30% or more based on the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 52.1-1992 test standards and the requirements of ASME AG-1-2003, Section FB-5000. The air-flow capacity shall be the same or greater than the HEPA filter for the same filter frame face area.

All prefilter housings should be equipped with a floor drain centered at the bottom with a condensate drain to prevent water from accumulating in the housing. The drain shall be connected to a condensate collection system. Drains from contaminated systems shall be piped to a radioactive waste system.

3.7 HEPA Filters

HEPA filters shall comply with the requirements of one of the following specifications:

- HNF-S-0552, “Specification for Procurement of Nuclear Grade High Efficiency Particulate Air Filters”
- HNF-S-0447, Specification for Procurement of Nuclear Grade High Efficiency Particulate Air Filters”
- RPP-SPEC-28675, “Radial HEPA Filter Procurement Specification”
- Applicable design requirements provided as notes on drawing H-2-90718, sheet 10.

3.7.1 HEPA Filter Service Life

The HEPA filter service life for existing systems shall be based on performance tests, taking into consideration the guidance described in DOE-HDBK-1169-2003, Appendix C.

3.8 HEPA Filter Housing

Housings shall be nuclear grade fluid seal HEPA filter rated for the design flow rate. They shall meet ASME N-509 and ASME AG-1-2003 requirements and be tested per ASME N-510. Additional detailed design requirements on existing ventilation systems are provided as notes on drawing H-2-90718, sheet 10.

3.9 Process Gas Treatment Equipment

Process gas treatment equipment shall be designed in accordance with ASHRAE and industrial standards. Process piping shall be designed in accordance with ASME B31.3.

3.10 Fans and Blowers

Exhaust fans shall be located downstream of air-cleaning filters.

The fan assembly shall be constructed of material that is compatible with interconnected ducting and/or stack. The exhaust fan shall be constructed of non-sparking materials. The exhaust fan shall be equipped with a method of limiting shaft leakage.

The fan shall be selected to operate on the stable portion of its performance curve at the design airflow range. The rating and characteristics of the fan must account for the pressure drops encountered from existing in-place components, loading of HEPA filters, etc.

The exhaust fan shall be specified to provide the required design pressure of the system.

3.11 Exhaust Stack

Discharge stacks shall provide for adequate dispersion of the exhaust air into the atmosphere. Dispersion calculations may be performed to determine whether elevated, ground-level or mixed mode effluent release is required to maintain offsite personnel exposures within the plant environmental permit and applicable federal, state, and local regulations. Stacks shall be designed in accordance with the requirements of ASME STS-1-2000 (or latest edition).

The ventilation system exhaust stack height shall be sufficient to disperse the exhaust gases to satisfy exposure levels and emissions analyses and to prevent re-entrainment.

Industrial hygiene sampling ports shall be provided on the stack, as required, in order to monitor or sample chemical constituent discharges from the stack.

3.12 Instrumentation and Controls

The instrumentation and control system shall be designed to operate in all environmental/ seasonal design conditions per TFC-ENG-STD-02.

The exhaust system shall also be capable of monitoring the pressure within the storage tanks in which the system is ventilating. The system shall also have interlocks to shut down the exhaust fan on abnormal tank pressure situations.

The components exposed to a ventilated space or exhaust stream shall meet the requirements of TFC-ENG-STD-13.

The control system shall meet, as a minimum, the requirements of National Electrical Manufacturer's Association Type 4, per NEMA ICS 6, for equipment enclosures.

All ventilation system instrumentation installations shall comply with the National Electrical Code (NEC).

All transmitters, temperature sensors (except thermocouples), and velocity probes shall be capable of 2% accuracy (of full scale) or better.

Protection systems and safety-significant instrumentation and control systems shall provide for periodic in-place testing and calibration of instrument channels and interlocks.

A low point drain shall be provided in all instrument tubing runs.

Differential pressure (DP) transmitters shall be rated as intrinsically safe for its application.

Differential pressure measuring devices shall be provided to indicate DP across the following system components (as applicable):

- Inlet plenum (tank pressure) relative to atmosphere
- In-line heater/moisture separator
- Prefilter
- First HEPA filter
- Second HEPA filter
- Both first and second HEPA filters
- Tank inlet HEPA filter (indication only)
- Moisture separator (or demister) installed in tank riser.

3.13 Inspection and Testing

Test plans and procedures shall be developed in accordance with tank farm procedures. Active (pressurized) ventilation systems shall be tested in accordance with ASME AG-1-2003 using a graded approach. Welding procedures and welder qualifications per ASME Section IX are acceptable. Weld inspection shall be per ASME B31.3. American Welding Society (AWS) codes shall be used for sheet metal arc welding and braze welding procedures, qualification of welders and welding operators, workmanship, and the inspection of production welds.

3.14 Stack Sampling and Monitoring System

Exhaust stacks shall be equipped with flow instrumentation, sample and measuring ports, and a particulate monitoring system. The monitoring system shall include the subsystems described below, as applicable.

3.14.1 Sample Collection System

The sample collection system shall be designed to operate in the environment expected in the stack. For existing tank farm ventilations systems, the sample collection system shall be designed to operate in a pH range of 10-14, relative humidity (RH) up to 85%, and a temperature range of 80 to 167°F (27 to 75°C). The system shall meet the requirements of ANSI/HPS N13.1-1999 and shall be designed to minimize depositional losses. The design shall optimize particulate penetration and provide justification for each percentage increase in depositional loss. The mounting design shall be such that the probes point into the gas stream. The system shall include redundant vacuum pumps, non-resetable volumetric flow totalizers for sample volume (record sampler and, if used, continuous air monitor (CAM)), a run-time mechanism for the vacuum pumps, sample flow rate indication, and a run time mechanism for the ventilation system fan.

The sample transport lines shall be provided with fittings that provide a near seamless connection at all tubing joints. The fittings shall enable a smooth transition of sample flow from the probe assembly to the sample transport line. Most compression-type fittings have step transitions. The above restrictions do not apply to the vacuum return lines that are connected downstream from the CAM heads or the record sample filter holder. The sample transport lines shall be insulated and heated to prevent condensation between the sample point and the entry into the sample pump and on the return line of the sample pumps to the exhaust stack.

3.14.2 Particulate Record Sampler

A permanently installed particulate record sampler is required for all emission points with a potential impact category (PIC) 1 and 2. One may be installed on a PIC 3 system as directed by management. The record sample loop shall consist of the sample probe, delivery tubing, a modified Gelman Sciences 47-millimeters (mm) filter holder, flexible hose/tubing, mass flow controller, vacuum gauge, isolation valves, and manifolding into the redundant vacuum pumps. The mass flow controller shall provide a flow signal to a programmable logic controller (PLC) with display and the sample flow rate shall be controlled by input from the PLC. Collection filter paper shall be 47-mm diameter Gelman Sciences Versapor® 3000, 0.0025-inches thick.

3.14.3 Particulate Beta Continuous Air Monitor

A permanently installed particulate beta CAM is required for all emission points with a PIC 1. The CAM loop shall consist of a sample probe, delivery tubing, the CAM, flexible hose/tubing, mass flow controller, vacuum gauge, isolation valves, and manifolding into the redundant vacuum pumps. The CAM shall be an Eberline model AMS-4 and meet the requirements of ANSI N42.18. Calculations shall be performed to determine the maximum air sample temperature at the CAM for the given design conditions.

3.14.4 Stack Flow Instrumentation

The stack shall be equipped with a Veris Verabar type multi-port flow element with integral resistance temperature detector (RTD) for temperature compensation and remote mount flow transmitter and qualified to 40 CFR 52, Appendix E. The instrumentation shall be compatible with exhaust stream temperature and constituents. The mounting design shall be such that the flow instrument can only be installed in the correct orientation.

Dedicated non-ground fault interrupted (non-GFI) circuits shall be provided for the stack effluent monitoring and sampling control circuits.

3.14.5 Environmentally Controlled Sample Cabinet

The effluent monitoring system cabinet shall enclose the record sample filter holder, the CAM detector head, the mass flow controllers for each loop, PLC with display, valves in the loops, and necessary wiring and terminal blocks. It shall be NEMA-rated and equipped with environmental controls and a door with handles (not clips). A heat load analysis shall be performed to verify that the maximum and minimum temperatures expected in the cabinets do not fall outside the published operating limits for the included equipment for all new systems.

3.15 Condensation Collection System

A condensate collection system shall be provided, where applicable, to ensure reliable operation of the ventilation system equipment, including flow control valves, flow instrumentation, and other sampling components. The condensate collection system shall be designed for ease of operation and removal of collected condensate. Requirements for the condensate collection, including the collection location(s) and required capacity and type of collection bottle shall be evaluated for all new systems.

3.16 Freeze Protection

Seasonal protection measures shall be incorporated into designs as described in TFC-ENG-STD-02. Heat tracing shall be installed on condensate lines and on the seal pot reservoir, as applicable. Heat trace shall be separated in at least two separate sections and provide indication that the heat trace is operating correctly. The heat trace system shall be thermostatically controlled to energize when the temperature drops below freezing. Heat trace inspection and testing shall be performed before addition of the insulation and installed in a manner to allow access for periodic testing. An indicating light shall be provided to show that the freeze protection (heat trace) is operational.

3.17 Structural Supports

For duct work systems, see Section 3.3 and Table 1. All equipment (e.g., fans, moisture separators, heat exchangers) attached to the ducts and weighing more than 75 pounds should be braced independently of the duct. Items (e.g., dampers or valves) attached to the duct should be positively supported by mechanical fasteners (not friction-type connections) to prevent their falling during an earthquake. Where it is desirable to limit the deflection of duct systems under seismic load, bracing in accordance with the SMACNA Seismic Restrain Manual may be used.

Lift points shall be provided for rigging, transportation, and site installation. The lift points shall be designed to lift the gross weight of the unit by crane and comply with the factor of safety requirements in the Hanford Site Hoisting and Rigging Manual (DOE-RL-92-36). The lifting points and the gross weight of the unit shall be identified on the drawing and on the skid.

3.18 Electrical

Electrical components shall meet the requirements of NEC (ANSI/NFPA 70), UL, and NEMA MG-1 (as applicable), and shall be provided with complete test reports.

Electrical materials and equipment shall be National Recognized Testing Laboratory (NRTL) listed or labeled, for the purpose intended.

Electrical power distribution enclosures shall provide means for lock and tag application. Provisions shall be made for isolating instruments and equipment from hazardous energy sources during calibration, maintenance and repair.

All power and instrumentation circuits shall be routed in separate raceways to ensure EMI/EMF noise does not impact the instrumentation, control, and alarm circuits.

The ventilation control system shall interface with field instrumentation. The instrument connection enclosure shall have a terminal board to provide the interface with off-skid equipment. Butt splicing of wires shall not be allowed. All wires shall be terminated on terminal strips.

3.18.1 Electrical Equipment Panels

The electrical enclosures shall meet the requirements of National Electrical Manufacturer's Association Type 3R or 4 per NEMA ICS 6. Some electrical control panel enclosures are assembled in accordance with UL 508-A, "General Use Industrial Control Panels."

For existing tank farm ventilation systems, electrical service to the system skid shall be 3-phase, 4-wire, 480 volt alternating current (VAC). The service disconnect shall be sized, as required, for the total electrical load and is provided in a weatherproof enclosure suitable for outdoor installation. The symmetrical short circuit current rating shall be as required to withstand the available fault current at the point of connection.

3.18.2 Alarm Panel

Alarm panels, when required, shall have a legible readout and local visual (a clear strobe light) annunciation for the alarm conditions.

3.18.3 Indicator Location

Fan "on/off" status lights shall be located near the fan start and stop switches.

3.18.4 Cabinet Temperature Control

The cabinets shall be controlled to maintain the interior cabinet temperature within the operating limits of installed equipment. The control cabinet temperature and humidity (if required) measurement shall be provided to aid in preventing the system from exceeding operating limits. Calculations for enclosure temperature and humidity requirements shall be performed in accordance with TFC-ENG-DESIGN-C-10.

All cabinets shall be equipped with environmental controls compatible with the requirements of the equipment contained in the enclosure. The maximum and minimum temperatures expected in the cabinets shall not fall outside the published operating limits for the included equipment.

All cabinets shall be fabricated to comply with UL-508A, ANSI/NFPA 70, and NFPA 79. A clear insulating cover shall be placed over energized parts (e.g., terminal blocks, motor starters, and/or relay blocks) if the voltage is above 50 volts to ground. The purpose of insulating cover is to prevent contact with energized parts. Applicable cabinets shall be labeled to indicate UL 508-A compliance.

3.19 Human Factors

The design shall meet the requirements of TFC-ENG-STD-23 and apply principles of human factors engineering regarding installation, operation, and maintenance of the ventilation system and equipment.

4.0 DEFINITIONS

acfm. Actual cubic feet per minute (see Airflow). A unit of volumetric flow rate that is uncorrected for standard conditions.

Air cleaning unit. An assembly of components comprising a self-contained subdivision of a complete air cleaning system. It includes all the components necessary to achieve a unit air cleaning function such as removing particulate matter (filter). A unit includes a housing plus internal air cleaning components and may include one or more auxiliary air treatment components such as pre-filters, post-filters, heaters, coils, and moisture separators.

Air density. The mass of air per unit volume. The density varies with temperature and pressure.

Airflow. (ACFM, SCFM) Volumetric flow of air expressed in terms of cubic feet of air per minute (CFM). Actual CFM (ACFM) is a cubic foot of air at actual conditions. Standard CFM (SCFM) is a cubic foot of air at standard air conditions. In order to avoid misunderstandings, the cfm of equipment is often expressed at standard air conditions (see standard air).

Design specification. A concise document defining technical requirements in sufficient detail to form the basis for a product, material, or process that indicates, when appropriate, the procedure or means that determines whether or not the given requirements are satisfied. The design specification includes requirements for performance and testing.

Duct. An air or gas path enclosure.

Graded approach. The process of ensuring that the level of analysis, documentation, and actions used to comply with a requirement in this part are commensurate with:

(1) The relative importance to safety, safeguards, and security
(2) The magnitude of any hazard involved
(3) The life-cycle stage of the facility
(4) The programmatic mission of the facility
(5) The particular characteristics of the facility
(6) The relative importance of radiological and non-radiological hazards, and
(7) Any other relevant factor.

HEPA filter. High-efficiency particulate air filter. A throwaway, extended-media dry type filter with a rigid casing enclosing the full depth of the pleats and exhibiting: (1) a minimum particle removal efficiency of 99.97% when tested with an aerosol of essentially monodispersed 0.3 micrometer diameter test aerosol particles; and (2) a maximum resistance-to-airflow, when clean, of 1.0 inch w.g. when operated at rated airflow capacity.

Interfacing systems. These are systems that physically connect to the system being evaluated, such as instrument air, electrical power, cooling water, piping, and valves.

Major stack. A stationary point source which has a potential to discharge radionuclides into the air in quantities which could cause an effective dose equivalent in excess of 0.1 mrem per year to members of the public. The potential to discharge radionuclides is based on the discharge of the effluent stream that would result if all pollution control equipment did not exist, but the facilities operations were otherwise normal. Major stacks are sometimes referred to as major sources or designated stacks.

Minor stack. A stationery point source which has a potential to discharge radionuclides into the air in quantities which could cause an effective dose equivalent less than 0.1 mrem per year to members of the public. Minor stacks are sometimes called minor sources or non-designated stacks.

Non-safety-related equipment. Equipment that is not required to perform safety-related functions.

Nuclear safety-related. A term applying to: (a) structures, systems, or components designed to perform a nuclear safety function; (b) drawings, specifications or procedures, analyses, and other documents used to determine or describe parameters affecting structures, systems, or components; (c) services to design, purchase, fabricate, handle, ship, store, clean, erect, install, test, operate, maintain, repair, refuel, and modify structures, systems, or components that are designed to perform a nuclear safety function.

Performance monitoring program. The technical basis established for collecting, trending, and analyzing system performance data to provide information about the health of a system. This process promotes the use of predictive indicators to avoid failures.

Periodic maintenance. Regularly scheduled equipment upkeep.

Plenum. A section of duct in the air flow path that has a sufficient cross-sectional area and depth to cause substantial reduction in flow velocities. The plenum may contain flow adjustment devices and may collect and distribute several air or gas streams.

Safety class structures, systems, and components. The structures, systems, or components, including portions of process systems, whose preventive or mitigative function is necessary to limit radioactive hazardous material exposure to the public, as determined from safety analyses (10 CFR 830.3).

Safety significant structures, systems, and components. The structures, systems, and components which are not designated as safety class structures, systems, and components, but whose preventive or mitigative function is a major contributor to defense in depth and/or worker safety as determined from safety analyses.

Service factor. The allowable loading above the nameplate rating at which the driver may be operated without exceeding the designated temperature rise of the driver. Service factor denotes the safety margin built into a driver.

Standard air. Standard air is defined as having a specific volume of 13.3 ft^3/lb. (0.832 m^3/kg) dry air (a density of 0.075 lb/ ft^3 (1.201 kg/m^3) dry air). This condition applies at 68°F (21˚C) and 29.92 in. Hg. (760 mm hg).

System boundary. A boundary defines where the two systems interface. The boundary exists at isolation valve, an electrical breaker, a piping connection point, or some other physical location that can be identified in the field and/or on a drawing.

Top hat. This term is used to describe the assembly used when dropping a camera into a tank riser for viewing. The camera is supported by a connecting flange at the top of the riser.

5.0 SOURCES

5.1 Requirements

1. DOE O 252.1, “Technical Standards Program.”

2. DOE Order 420.1B, “Facility Safety.”

3. TFC-PLN-03, “Engineering Program Management Plan.”

5.2 References

1. 10 CFR 830, "Nuclear Safety Management."

2. 40 CFR 52, "Protection of Environment."

3. 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," Subparts H and I, "National Emission Standard for Radionuclide Emissions from Department of Energy Facilities."

4. ACGIH 2004, "Industrial Ventilation: A Manual of Recommended Practice."

5. ANSI/ASME AG-1-2003, "Code On Nuclear Air and Gas Treatment."

6. ANSI/ASME B31.3, "Process Piping."

7. ANSI/HPS N13.1-1999, "Sampling and Monitoring Release of Airborne Radioactive Substances from Stacks and Ducts of Nuclear Facilities."

8. ANSI/NFPA 70, "National Electrical Code," National Fire Prevention Association.

9. ASHRAE 52.1, "Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter."

10. ASHRAE - Handbook 2005 Fundamentals.

11. ASHRAE - Handbook 2004 Systems and Equipment.

12. ASHRAE - Handbook 2003 Applications.

13. ASME, BPVC (Boiler and Pressure Vessel Code), Section IX-2001, "Welding and Brazing Qualifications."

14. DOE-HDBK 1169-2003, "Nuclear Air Cleaning Handbook: Design, Construction, and Testing of High-Efficiency Air Cleaning Systems For Nuclear Application," fourth edition.

15. DOE/RL-92-36, "Hanford Site Hoisting and Rigging Manual."

16. H-2-90718, Sheet 10, "Piping Air Filter Installation Atmospheric Breathing."

17. HNF-S-0552, "Specification for Procurement of Nuclear Grade High Efficiency Particulate (HEPA) Filters."

18. HNF-S-0477, "Specification for Procurement of Nuclear Grade High Efficiency Particulate Air (HEPA) Filter Sizes and Shapes NOT Covered by ASME AG-1."

19. MIL-STD-889, "Dissimilar Metals."

20. National Earthquake Hazard Reduction Program (NEHRP), 1997, Section 6.3.10, HVAC Ductwork.

21. NEMA ICS 6, “Industrial Controls and Systems.”

22. NEMA MG-1, “Motors and Generators, National Electrical Manufacturers Association.”

23. NFPA 79, “Electrical Standard for Industrial Machinery,” 2002.

24. OSD-T-151-00007, “Operating Specifications for Double-Shell Waste Storage Tanks.”

25. OSD-T-151-00013, “Operating Specifications for Single Shell Waste Storage Tanks.”

26. OSD-T-151-00019, “Operating Specifications for the 241-AZ-702 Vessel Ventilation System.”

27. RPP-RPT-28583, “Technical Basis Document for TFC-ENG-STD-07, Ventilation System Standard.”

28. RPP-SPEC-28675, “Radial HEPA Filter Procurement Specification.”

29. SMACNA, “Fibrous Glass Duct Construction Standards.”

30. SMACNA, “HVAC Air Duct Leakage Test Manual.”

31. SMACNA, “HVAC Duct Construction Standards – Metal and Flexible System Codes and Standards.”

32. SMACNA, “Industrial/Duct Construction (Class I).”

33. SMACNA, “Seismic Restraint Manual - Guidelines for Mechanical Systems.”

34. TFC-ENG-DESIGN-C-10, “Engineering Calculations.”

35. TFC-ENG-DESIGN-D-13.2, “Guidance for Applying Engineering Codes and Standards to CH2M HILL Statements of Work.”

36. TFC-ENG-STD-02, “Environmental/Seasonal Requirements for TOC Systems, Structures, and Component.”

37. TFC-ENG-STD-06, “Design Loads for Tank Farm Facilities.”

38. TFC-ENG-STD-13, “Ignition Source Control Evaluation.”

39. TFC-ENG-STD-23, “Human-Machine Interface For Process Control Systems.”

40. TFC-ESHQ-Q_ADM-C-02, “Nonconforming Item Reporting and Control.”

41. TFC-ESHQ-Q_ADM-CD-04, “Quality Assurance Program Description Implementation Matrix.”

42. TFC-ESHQ-FP-STD-06, “Fire Hazard Analysis and Fire Protection Assessment Requirements.”

43. UL 508, “UL Standard for Safety Industrial Control Equipment,” Seventeenth Edition, 1999.

44. American Welding Society (AWS) Codes.

Table 1. Ventilation System Codes and Standards for Design/Procurement of Safety Class, Safety Significant, and General Service Components.

Application	Safety Class	Safety Significant	General Service
Environmental Regulations	WAC 173-303; WAC 173-400; WAC 173-401; WAC 173-460; WAC 246-247; 40 CFR 61 Subpart H	(Same)	(Same)
Air Handling Units (Fans or Blowers)	ASME AG-1-2003, Section BA	ASHRAE; ARI 430, AMCA 99; AMCA 210; AMCA 300, AMCA 301; NEMA MG1; NFPA 70; SMACNA or may be the same as Safety Class	ASHRAE; ARI 430, AMCA 99; AMCA 210; AMCA 300, AMCA 301; NEMA MG1; NFPA 70; SMACNA or may be the same as Safety Class
Duct Work	ASME AG-1-2003, Section SA or ASME B31.3	IMC, SMACNA or may be the same as Safety Class	IMC, SMACNA or may be the same as Safety Class
Tube & Fin Heating Coils or Cooling Coils	ARI	ARI	ARI
Refrigeration Equipment	ASME AG-1-2003, Section RA	ARI or may be the same as Safety Class	ARI or may be the same as Safety Class
Air Heaters	ASME AG-1-2003, Section CA	ASHRAE, NFPA & Industrial Standards	ASHRAE, NFPA & Industrial Standards
Process Gas Treatment Equipment	ASHRAE, ASME B31.3	ASHRAE, ASME B31.3	ASHRAE, ASME B31.3
Moisture Separators	ASME AG-1-2003, Section FA; ASME N509	Same as Safety Class	ASHRAE & Industrial Standards
Housings	ASME AG-1-2003, Section HA	Same as Safety Class	Industrial Standards
HEPA Filters	ASME AG-1-2003, Section FC, ASHRAE Standard 52.1, MIL-F-51068F, DOE-NE-STD-F3-45, U.L. 900, U.L. 586; NFPA 90A	Same as Safety Class	ASHRAE Standard 52.1 or may be the same as Safety Class

Table 1. Ventilation System Codes and Standards for Design/Procurement of Safety Class, Safety Significant, and General Service Components. (cont.)

Application	Safety Class	Safety Significant	General Service
Medium Efficiency Filters	ASME AG-1-2003, Section FB, ASHRAE Standard 52.1, MIL-F-51068F, DOE-NE-STD-F3-45	Same as Safety Class	ASHRAE Standard 52.1 or may be the same as Safety Class
Carbon Filters	ASME AG-1-2003, Section FF	Same as Safety Class	Same as Safety Class
Sintered Metal Filters	ASHRAE and MPIF	ASHRAE and MPIF	ASHRAE and MPIF
Filter Frames	ASME AG-1-2003, Section FG	Same as Safety Class	ASHRAE & Industrial Standards or may be the same as Safety Class
Dampers	ASME AG-1-2003, Section DA	Same as Safety Class	ASHRAE & Industrial Standards or may be the same as Safety Class
Control Valves	ASME B16.5 and ASME B31.1	Same as Safety Class	Same as Safety Class
Instrumentation and Controls	ASHRAE	Same as Safety Class	Industrial Standards or may be the same as Safety Class
Ductwork Support Structural Requirements	In accordance with ASCE 7-98, IBC, and NEHRP	Same as Safety Class	SMACNA or may be the same as Safety Class
Stack	ASME AG-1-2003, Section AA, ASME STS-1-2000, and ASHRAE.	Same as Safety Class	ASME STS-1-2000 and ASHRAE.
Effluent Monitoring System	ANSI/HPS N13.1-1999	Same as Safety Class	Same as Safety Class